Attorney Docket No. 22422.00

IN THE APPLICATION

OF

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FOR A

**LIQUID FERTILIZER INJECTOR SYSTEM FOR LAWN SPRINKLER SYSTEMS AND IRRIGATION SYSTEMS**

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# LIQUID FERTILIZER INJECTOR SYSTEM FOR LAWN SPRINKLER SYSTEMS AND IRRIGATION SYSTEMS

## BACKGROUND OF THE INVENTION

### 1. FIELD OF THE INVENTION

The present invention relates to a liquid fertilizer injector system for lawn sprinkler systems and irrigation systems.

### 2. DESCRIPTION OF THE RELATED ART

Lawn sprinkler systems and irrigation systems are convenient and useful for helping users maintain a healthy lawn or harvest. These lawn sprinkler systems and irrigation systems are known to those that are skilled in the art and serve as a convenient way for people to water their lawn or crops. Users can also apply fertilizer to their lawn or crops by using a fertilizer system for even better results.

United States Patent Application Publication Number 2002/0000476, published on January 3, 2002, describes the use of an improved liquid fertilizer distribution manifold operating in

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two stages, which includes an accumulator piston located above the primary and secondary ports. A broad range of regulated flow for site-specific farming results in precise, accurate and timely application of liquid fertilizer and pesticides.

United States Patent Application Publication Number 2002/0144735, published on October 10, 2002, describes uniformly distributing and selectively outputting multiple fluid streams of a single or multiple-phase fluid from a fluid distributor manifold. More particularly, the publication discloses a method and system for distributing liquid fertilizer at a substantially equal rate to each of a plurality of distribution lines.

United States Patent Application Publication Number 2002/0145057, published on October 10, 2002, describes the use of a fertilizer mixing device for sprinkler systems including a water inlet, a first water outlet and a second water outlet. The water inlet is in communication with an existing water source. A mixing chamber has a housing having a first opening therein for receiving the first water outlet of the water inlet pipe therein.

U.S. Pat. No. 3,770,198, issued to Mihara, discloses a method and an apparatus for diluting and mixing a variety of

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chemical solutions such as farm chemicals, pesticides and liquid fertilizers with water to a predetermined proportion.

U.S. Pat. No. 4,171,710 issued to Boynton et al., outlines the use of a closed system for simultaneously mixing pesticide with water and transferring the same to a storage or spray tank for subsequent use. The system includes a pipe casing having a water inlet section for connection to a pump and a water discharge section for connection to the spray tank with a venturi chamber defined between the two.

U.S. Pat. No. 4,324,294, issued to McLoughlin et al., teaches the use of a system for injecting chemicals into a fire fighting system of the type using a plurality of water hoses and having a source of water and a source of chemicals. A servo motor system is connected to automatically meter a certain ration of chemicals into the water supply. The servo motor system is responsive to the total flow to control the chemical pump in order to pump a certain ration of chemicals into the water supply, even if the total flow varies.

U.S. Pat. No. 4,527,353, issued to Newby, shows the use of an irrigation and fertilization control and distribution system characterized by a distribution network and a control assembly coupling the distribution network to a pressurized water source.

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The control assembly includes an on/off valve mechanism operative to supply water to the distribution network, when the ambient temperature exceeds a predetermined level, and a fertilizer metering mechanism operative to supply liquid fertilizer to the distribution network on the rising portion of a temperature cycle.

U.S. Pat. No. 4,768,712, issued to Terrell, describes the use of a selective liquid fertilizer blending system and apparatus associated with golf courses utilizing automatic irrigation systems to irrigate the various species of turf grasses used on fairways, tees, greens and other areas, the system being adapted to selectively and continuously blend, in a spoon feeding manner, the agronomically correct ratios of liquid fertilizer and irrigation water.

U.S. Pat. No. 4,867,192, issued to Terrell et al., discloses the use of a selective liquid fertilizer blending system and apparatus associated with golf courses utilizing automatic irrigation systems, to irrigate the various species of turf grasses used on fairways, tees, greens and other areas, which includes devices for monitoring and adjusting the pH of the irrigation water.

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U.S. Pat. No. 4,870,991, issued to McMillan et al., teaches the use of an apparatus for directing a liquid fertilizer into an irrigation system having a liquid fertilizer flow conduit with the valve of a solenoid valve and the float of a float switch located in series and an electric circuit with the switch of the float switch, solenoid of the solenoid valve and automatic timer device in series. The apparatus directs fertilizer therethrough when electricity is delivered to the switch, solenoid and automatic timer device when the switch is closed by the float and the timer is conducting electricity.

U.S. Pat. No. 4,895,303, issued to Freyvogel, shows the use of a sprinkler system fertilization regulator that automatically mixes a plurality of chemicals for the purpose of fertilization, weed control or insect control. An electrically operated manifold distributes the chemical and water stream to each of the sprinkler zones provided. The output stream pressure is programmable, constant and independent of the incoming fresh water pressure.

U.S. Pat. No. 5,227,068, issued to Runyon, describes the use of methods and apparatuses for enhancing water quality. More particularly, it relates to providing improved irrigation to vegetation in open areas, such as parks and golf courses.

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U.S. Pat. No. 5,730,364, issued to Gertie, discloses the use of an automatic fertilizing device, which is installed inline with a below ground water line for an underground sprinkler system, thus placing the entire device below the surface. The device has a fertilizer tablet chamber with an inlet and an outlet at opposite ends, which are connected to the inlet and outlet side of the water line. A fertilizer replenishment passage extends upwardly from the chamber, with an upper end positioned at or below ground level.

U.S. Pat. No. 6,148,839 issued to Gonske, teaches the use of an apparatus and method for injecting a liquid product or chemical into a main water supply line used for agricultural or industrial purposes. A pressure regulating bypass valve has an inlet side connected to an outlet line of a multi-ganged, diaphragm pump. The pump is run at a constant speed and produces a non-pulsatile flow of product. The bypass line of the valve is connected to an inlet line of the pump. The bypass valve is set at a predetermined pressure, discharging any excess product into the bypass line.

U.S. Pat. No. 6,173,732, issued to Davis et al., shows the use of a chemical feeding system for adding either liquid or 100% soluble solid chemicals including fertilizer, insecticide

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and herbicide to a lawn sprinkler system, either above or below ground level. The system has one or two vertically oriented mixing chambers containing a removable sponge filter. An effluent tube is attached to the bottom of the mixing chamber for recycling through an adjustable flow meter valve. A drain tube with a shutoff valve and a one-way check valve leads to the main sprinkler system.

U.S. Pat. No. 6,267,303, issued to Francis, describes the use of a device for injecting liquid chemical solutions into the flow of a lawn sprinkler system. The device allows the user to easily attach and remove chemical jars without the risk of losing the prime on the pump.

Great Britain Patent No. 864,241, published March 29, 1961, discloses the use of an injector assembly for automatically injecting liquid fertilizer into an irrigation system for greenhouses, groves or orchards in proportion to the rate of flow of water therein.

Great Britain Patent No. 1,566,583, published May 8, 1980, teaches the use of an apparatus for mixing water and fertilizer for use in the automatic irrigation and fertilization of plants in a greenhouse, especially a small domestic greenhouse.

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Although each of these patents and publications describe irrigation or sprinkler devices, what is really needed is a device to provide a constant volume of liquid fertilizer solution into a lawn sprinkler system without diluting the fertilizer solution. Such an apparatus or device would be well-received in the marketplace and would address a strong demand for such a device or apparatus.

None of the above inventions and patents, taken either singly or in combination, is seen to describe the instant invention as claimed. Thus a liquid fertilizer injector system for irrigation and sprinkler systems solving the aforementioned problems is desired.

## SUMMARY OF THE INVENTION

The present invention is a liquid fertilizer injector system attached to a source of water by a water source line. The system has an inlet line to input the water from the water source line into the liquid fertilizer injector system. The system's components include a holding tank to receive the water from the inlet line, a collapsible impermeable bag filled with liquid fertilizer that is placed in the holding tank, the water

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from the inlet line collecting in the holding tank and exerting pressure on the collapsible impermeable bag as the water collects in the holding tank, an outlet line to disperse the liquid fertilizer back to the water source line, a port position indicator valve on the outlet line to incrementally control the flow of liquid fertilizer from the outlet line back to the water source line, and a drainage valve to drain any input water in the holding tank.

Accordingly, it is a principal object of the invention to provide a liquid fertilizer system that can be easily incorporated into an existing lawn sprinkler system or irrigation system.

It is another object of the invention to provide a constant volume of liquid fertilizer solution into a lawn sprinkler system or irrigation system without diluting the fertilizer solution.

It is a further object of the invention to provide a liquid fertilizer injection system that can be easily installed to an existing lawn sprinkler system or irrigation system.

It is an object of the invention to provide a liquid fertilizer injection system that promotes lawn and crop growth and reduces water consumption.

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It is an object of the invention to provide improved elements and arrangements thereof for the purposes described which is inexpensive, dependable and fully effective in accomplishing its intended purposes.

These and other objects of the present invention will become readily apparent upon further review of the following specification and drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic diagram of a first embodiment of a liquid fertilizer injector system being adjoined to a water source line according to the present invention.

Fig. 2 is a side perspective view of a union connection and injector valve of the liquid fertilizer injector system.

Fig. 3 is a chart showing the steps in a method of utilization of the first embodiment of the liquid fertilizer injector system.

Fig. 4 is a schematic diagram of a second embodiment of a liquid fertilizer injector system according to the present invention.

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Fig. 5 is chart showing the steps in a method of utilization of the second embodiment of the liquid fertilizer injector system.

Similar reference characters denote corresponding features consistently throughout the attached drawings.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is a liquid fertilizer injector system **10**, as is shown in Fig. **1**. The system is connected to a water source line **15** connected to a water source (not shown).

The liquid fertilizer injector system **10** comprises a tank inlet line **20** to input water from the water source line **15** into the liquid fertilizer injector system **10**, a holding tank **30** to receive the water from the inlet line **20**, a collapsible impermeable bag **40** that is filled with liquid fertilizer **LF** and is placed in the holding tank **30**, the water from the inlet line **20** collecting in the holding tank **30** and exerting pressure on the collapsible impermeable bag **40** as the water collects in the holding tank **30**. The liquid fertilizer injector system **10** further comprises an outlet line **50** to disperse the liquid fertilizer **LF** from the bag **40** to the water source line **15**

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downstream from the tank inlet line **20**, a port position indicator valve **60** on the outlet line **50**, to incrementally control the flow of liquid fertilizer **LF** from the outlet line **50** to the water source line **15** and a drainage valve **70** to drain and release any input water in the holding tank **30**.

Typically the water from the water source line **15** is controlled by a valve **22** on the inlet line **20** as it goes into the holding tank **30**. Once in the holding tank **30**, which can act as a closed system, water collects in the holding tank **30** and surrounds the collapsible impermeable bag **40**, which is attached to the outlet line **50**. The water does not react directly with the liquid fertilizer **LF** in the collapsible impermeable bag **40** because the collapsible impermeable bag **40** is not penetrated by the water. Instead, pressure is asserted by the water **W** in the holding tank **30** on the collapsible impermeable bag **40**. This design allows for a constant and steady flow of liquid fertilizer **LF** from the collapsible impermeable bag **40** and into the outlet line **50**, which is desirable for better control of the liquid fertilizer **LF** as it goes through the liquid fertilizer injector system **10**.

A port position indicator valve **60** is provided on the outlet line **50** to control the outflow of liquid fertilizer **LF**

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coming from the collapsible impermeable bag **40**. The port position indicator valve **60** can be incrementally set in a fully closed position, a 3/4ths closed position, a 1/2 closed position, a 1/4th closed position and a fully open position. Once passed through the port position indicator valve **60**, the liquid fertilizer **LF** is drawn back into the water source line **15** by a union connection **80** and injector valve **90**, which are discussed in more detail below.

Once the liquid fertilizer **LF** is emptied and is completely pushed out of the collapsible impermeable bag **40**, a drainage valve **70** is used to empty water from the holding tank **30**. The drainage valve **70** can be opened when the collapsible impermeable bag **40** is out of liquid fertilizer **LF** and the bag **40** may be easily replaced or refilled with liquid fertilizer **LF** for use again.

Fig. **2** depicts the dynamics of what happens in the water fertilizer injector system **10** at the point where the outlet line **50** meets with the water source line **15**. A modified T-shaped combination injector valve **90** and union connection **80** is used to combine the outlet line **50** with the water source line **15**. The combination injector valve **90** and union connection **80** acts like an aspirator (not shown) on the outlet line **50**, which draws the

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liquid fertilizer **LF** in the outlet line **50** into the water source line **15**.

The liquid fertilizer injector system **10** can be used with any type of water source lines **15**, such as those from a city water main or a pumped well water line, and which are typically used in combination with a lawn sprinkler system (not shown) or from an irrigation system (not shown).

A chart **100** showing a method for operating the first embodiment of the liquid fertilizer injector system **10** is outlined in Fig. **3**. The method comprises the steps of receiving the water from the water source, combining the water with the liquid fertilizer **LF** from within the liquid fertilizer injection system **10**, distributing the liquid fertilizer **LF**, controlling the flow of the liquid fertilizer **LF** from the liquid fertilizer injection system **10** and maintaining the liquid fertilizer injection system **10** as needed. The method further comprises the additional step of allowing the water to exert pressure on the liquid fertilizer **LF** that is kept in a collapsible impermeable bag **40** within a holding tank **30**. The method further comprises an additional step of using an incremental port position indicator valve **60** for controlling the flow of the liquid fertilizer **LF**, and further comprises an additional step of draining any water from the liquid fertilizer

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injection system **10** when the collapsible impermeable bag **40** is emptied.

Fig. **4** depicts a second embodiment of the liquid fertilizer injector system **110**. In the second embodiment, the liquid fertilizer injector system **110** is attached to a water source line **15**, and comprises a tank inlet line **20** to receive water **W** from the water source line **15**, a mixing tank **120** to receive water from the inlet line **20**, a feeding chamber **130** where liquid fertilizer **LF** is added to the mixing tank **120** to form a mixture **W + LF** of water and liquid fertilizer in the mixing tank **120**, an agitator **140** to promote mixing and solubility between the water **W** from the inlet line **20** and the liquid fertilizer **LF** from the feeding chamber **130** within the mixing tank **120** and an outlet line **50** to disperse a water and liquid fertilizer mix **W+LF** back to the water source line **15** from the mixing tank **120**. There is also a port position indicator valve **60** on the outlet line **50**, to incrementally control the flow of water and liquid fertilizer mix **W+LF** from the outlet line **50** back to the water source line **15**, as in the first embodiment of the liquid fertilizer injector system **10**. The port position indicator valve **60** can go into a fully closed position, a 3/4ths closed position, a 1/2 closed position, a 1/4th closed position and a fully open position.

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Similarly, the second embodiment of the liquid fertilizer injector system **110** also utilizes a drainage valve **70** and a union connection **80** that produces an aspirator effect and draws the water and liquid fertilizer mix **W+LF** from the outlet line **50** into the water source line **15**. The water source line **15** can be for a lawn sprinkler system (not shown) or for an irrigation system (not shown) that incorporates the second embodiment of the liquid fertilizer injector system **110**.

Fig. 5 shows a chart **150** depicting the steps in a method that utilizes the second embodiment of the liquid fertilizer injector system **110**. The method for operating the second embodiment liquid fertilizer injector system **110** comprises the steps of receiving the water **W** from the water source, reacting the water **W** with the liquid fertilizer **LF**, distributing the water and liquid fertilizer mix **W+LF**, controlling the flow of the water and liquid fertilizer mix **W+LF**, and maintaining the system **110** as needed. The comprises the additional steps of the water **W** reacting with the liquid fertilizer **LF** in an agitated mixing tank **120** and using a port position indicator valve **60** for controlling the flow of the water and liquid fertilizer **W+LF**.

Usage and installation of both the first embodiment of the liquid fertilizer injector system **10** and the second embodiment of

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the liquid fertilizer injector system **110** is uncomplicated. Either embodiment can be added onto a water source line **15** without significant loss of flow and water pressure to a water source such as a city water main or pumped well water line.

It is to be understood that the present invention is not limited to the embodiments described above, but encompasses any and all embodiments within the scope of the following claims.

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